

I CLAIM:

1    1. A method for mounting a protuberant conductive contact to an  
2    electronic component, the method comprising sequential steps  
3    of:

4                providing a wire having a continuous feed end,  
5                intimately bonding the feed end to the component,  
6                forming from the bonded feed end a stem which protrudes  
7                from the component and has a first stem end thereat,  
8                severing the stem at a second stem end to define a  
9                skeleton,  
10                depositing a conductive material to envelope the skeleton  
11                and adjacent surface of the component.

1    2. The method as claimed in Claim 1, and immediately before the  
2    severing step intimately bonding the second stem end to the  
3    component.

1    3. A method for mounting a protuberant conductive contact to an  
2    electronic component, the method comprising sequential steps  
3    of:

4                providing a wire having a continuous feed end,  
5                intimately bonding the feed end to the component,  
6                forming from the bonded feed end a stem which protrudes  
7                from the component and has a first stem end thereat,

8                    severing the stem at a second stem end to define a  
9                    skeleton,

10                  depositing a conductive material to jacket the skeleton  
11                  and adjacent surface of the component.

1                  4. The method as claimed in Claim 1, and immediately after the  
2                  severing step, continuing sequentially the bonding step and  
3                  the forming step and the severing step for a predetermined  
4                  number of stems to comprise the skeleton.

5                  5. The method as claimed in Claim 4, and immediately before each  
6                  of the severing steps each of the second stem ends is inti-  
7                  mately bonded to the component.

1                  6. A method for mounting a protuberant conductive contact to a  
2                  conductive terminal on an electronic component, the method  
3                  comprising sequential steps of:

4                    providing a wire having a continuous feed end,

5                    intimately bonding the feed end to the terminal,

6                    forming from the feed end a stem which protrudes from the  
7                  terminal and has a first stem end thereat,

8                    severing the stem at a second stem end to define a  
9                  skeleton,

10                  depositing a conductive material to envelop the skeleton  
11                  and adjacent surface of the terminal.

1       7. The method as claimed in Claim 6, and immediately before the  
2       severing step intimately bonding the second stem end to the  
3       terminal.

1       8. The method as claimed in Claim 6, and immediately after the  
2       severing step, continuing sequentially the bonding step and  
3       the forming step and the severing step for a predetermined  
4       number of stems to comprise the skeleton.

1       9. The method as claimed in Claim 8, and immediately before each  
2       of the severing steps each of the second stem ends is inti-  
3       mately bonded to the terminal.

1       10. A method for mounting a protuberant conductive contact to a  
2       conductive terminal on an electronic component, the method  
3       comprising sequential steps of:

4                 providing a wire having a continuous feed end,  
5                 intimately bonding the feed end to the terminal,  
6                 forming from the bonded feed end a stem which protrudes  
7                 from the terminal and has a first stem end thereat,  
8                 severing the stem at a second stem end to define a  
9                 skeleton,

10                 depositing a conductive material to jacket the skeleton  
11                 and adjacent surface of the terminal.

1 11. The method as claimed in Claim 10, and immediately before the  
2 severing step intimately bonding the second stem end to the  
3 terminal.

1 12. The method as claimed in Claim 10, and immediately after the  
2 last mentioned severing step continuing sequentially the  
3 bonding step and the forming step and the severing step for a  
4 predetermined number of stems to comprise the skeleton.

1 13. The method as claimed in Claim 12, and immediately before each  
2 of the severing steps each of the second ends is intimately  
3 bonded to the terminal.

1 14. A method for mounting a protuberant conductive contact to a  
2 conductive terminal on an electronic component, the method  
3 comprising sequential steps of:  
4 providing a wire having a continuous feed end,  
5 intimately bonding the feed end to the terminal,  
6 forming from the bonded feed end a stem which protrudes  
7 from the terminal and has a first stem end thereat,  
8 intimately bonding a second stem end to the terminal,  
9 sequentially continuing the forming step and the bonding  
10 step for a predetermined number of times,  
11 after the last bonding step severing the stem to define  
12 a skeleton,

~~depositing a conductive material to envelop the skeleton and adjacent surface of the terminal.~~

15. A method for mounting a protuberant conductive contact to a conductive terminal on an electronic component, the method comprising sequential steps of:

providing a wire having a continuous feed end,

intimately bonding the feed end to the terminal,

forming from the bonded feed end a stem which protrudes from the terminal and has a first stem end thereat,

bonding a second stem end to a sacrificial member mounted in spaced relationship from the component,

severing the stem at the second stem end to define a skeleton,

depositing a conductive material to envelop the skeleton and at least adjacent surface of the component,

eliminating the sacrificial member.

16. The method as claimed in Claim 15, wherein during the eliminating step the second stem ends are severed from the sacrificial member.

17. The method as claimed in Claim 6, 7, 8, 9, 14 or 15, performed on a plurality of the terminals on the electronic component.

1 18. The method as claimed in Claim 17, performed on a plurality of  
2 wires on a plurality of the terminals on the electronic  
3 component.

1 19. The method as claimed in Claim 17, with the bonding performed  
2 by applying at least one of a group consisting of superambient  
3 pressure, superambient temperature and ultrasonic energy.

1 20. The method as claimed in Claim 17, wherein the severing is  
2 performed by melting the wire.

1 21. The method as claimed in Claim 17, wherein the forming steps  
2 and the severing steps are performed by a wirebonding appara-  
3 tus, and after the severing steps but before the depositing  
4 step shaping the skeleton by means of a tool external to the  
5 apparatus.

1 22. The method as claimed in Claim 17, wherein the severing of the  
2 second ends is performed by mechanical shearing.

1 23. The method as claimed in Claim 17, wherein during the forming  
2 step the shape of the stems is determined by means of a  
3 software algorithm in a control system of an automated  
4 wirebonding apparatus.

1 24. The method as claimed in Claim 6, 7, 8, 9 or 15, performed on  
2 a plurality of the terminals, wherein shape of the skeleton  
3 and mechanical properties of the conductive material are  
4 organized collectively to impart resilience to the protuberant  
5 conductive contact.

1 25. The method as claimed in Claim 24, wherein the conductive  
2 material is provided with a multitude of microprotrusions on  
3 its surface.

4 26. The method as claimed in Claim 17, with the depositing step  
5 including placement of a plurality of layers each differing  
6 from one another.

1 27. The method as claimed in claim 24, wherein the depositing step  
2 includes placement of a plurality of layers each differing  
3 from one another.

1 28. The method as claimed in Claim 27, wherein at least one of the  
2 layers comprising conductive material has a jagged topography  
3 in order to reduce contact resistance of the protuberant  
4 conductive contact when mated to a matching terminal.

1 29. The method as claimed in Claim 17 or 24, wherein the  
2 deposition is performed by means of electrochemical plating in  
3 an ionic solution.

1 30. The method as claimed in Claim 6 or 8, performed on a plurali-  
2 ty of the terminals and, wherein:  
3       the forming steps result in a plurality of free-standing  
4 protuberant stems,  
5       the severing steps are performed on the respective stems  
6 all in a common plane.

1 31. The method as claimed in Claim 6 or 8, performed on a  
2 plurality of the terminals on at least one electronic  
3 component and, wherein:  
4       the terminals are in different planes,  
5       the forming steps result in a plurality of free-standing  
6 protuberant stems,  
7       the severing steps are performed on the respective stems  
8 all in a common plane.

1 32. The method as claimed in Claim 6 or 8, performed on a  
2 plurality of the terminals on at least one electronic  
3 component, wherein shapes of the skeleton and mechanical  
4 properties of the conductive material are organized  
5 collectively to impart resilience to the protuberant  
6 conductive contacts, and the severing steps are performed on  
7 the stems all in a common plane.

1 33. The method as claimed in Claim 17 or 24, wherein the cross-  
2 sectional area of the wire is rectangular.

1 34. The method as claimed in Claim 26 or 27, wherein the wire is  
2 made of a metal selected from a group consisting of gold,  
3 silver, beryllium, copper, aluminum, rhodium, ruthenium,  
4 palladium, platinum, cadmium, tin, lead, indium, antimony,  
5 phosphorous, boron, nickel, magnesium and alloys thereof, and  
6 wherein at least one of the layers of the conductive material  
7 is a metal selected from a group consisting of nickel,  
8 phosphorous, boron, cobalt, iron, chromium, copper, zinc,  
9 tungsten, tin, lead, bismuth, indium, cadmium, antimony, gold,  
10 silver, rhodium, palladium, platinum, ruthenium and alloys  
11 thereof.

1 35. The method as claimed in Claim 6, 7, 8, or 14, performed on at  
2 least one terminal on an electronic component, wherein the  
3 wire is made primarily of a metal selected from a group  
4 consisting of gold, copper, aluminum, silver, lead, tin,  
5 indium and alloys thereof; the skeleton is coated with a first  
6 layer of the conductive material selected from a group  
7 consisting of nickel, cobalt, boron, phosphorous, copper,  
8 tungsten, titanium, chromium, and alloys thereof; a top layer  
9 of the conductive material is solder selected from a group  
10 consisting of lead, tin, indium, bismuth, antimony, gold,  
11 silver, cadmium and alloys thereof.

1 36. The method as claimed in Claim 26 or 27, wherein a layer  
2 reactive with material of the wire is interposed between the  
3 skeleton and the conductive material.

1 37. The method as claimed in Claim 26 or 27, wherein the wire is  
2 gold and the reactive layer is tin.

1 38. An electronic component a first and a second surface in which  
2 on at least one of the surfaces is provided a plurality of the  
3 terminals having protuberant conductive contacts mounted  
4 thereto and made by means of the method as claimed in any of  
5 Claims 6, 7, 8, 14, 15 or 34.

\* \* \* \* \*